USAWC STRATEGY RESEARCH PROJECT

CHANGES IN INSTRUCTIONAL SYSTEM DESIGN (ISD): IMPROVING TRAINING PRODUCT DELIVERY TO UNITED STATES ARMY SOLDIERS

by

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ABSTRACT

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The purpose of this study is to identify methods that could speed up the instructional system design process currently used by the U. S. Army. The current Army Instructional System Design process is the Systems Approach to Training (SAT), a thirty-year-old process. SAT is an industrial age process being applied to an information age Army. This study surveyed Army training development experts about what they see as the significant challenges in the SAT process. This Strategic Research Project describes the strengths and weaknesses of the current process. The ultimate goal is to give training leaders recommendations that, if implemented, will make a significant impact on the effectiveness of the SAT process. Recommend in the short-term that TRADOC immediately hire and train more training developers. This is regardless of the ISD system that is eventually chosen. TRADOC lacks a sufficient number to accomplish the mission. TRADOC Schools should form the Training Developers into multi-disciplinary teams and use automated tools that will speed the SAT process (e.g. Designers Edge). Additionally, the report recommends an emphasis on the evaluation of the SAT process as a part of the Quality Assurance Office mission. To develop a long-term solution TRADOC should immediately begin experimenting with Rapid Prototyping in a head-to-head contest with the SAT process.

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PREFACE

Understanding Instructional System Design as it is practiced today throughout the Army will give leaders the information needed to improve the process. The greatness of our Army Training Programs is exemplified in the highly effective and professional force that the nation currently enjoys. The improvement that might be realized by a deep understanding of the process is worth the effort if it saves but one Soldier's life due to improved training and education products. The purpose of the research is to describe the current situation “with the bark on,” as our current Secretary of Defense Donald Rumsfeld likes to say. Additionally, it will provide training leaders actionable policy recommendations to increase SAT effectiveness.

ACKNOWLEDGEMENTS

The immeasurable help and assistance of Doctor Anna Waggener and Doctor William Johnsen were instrumental in the completion of this project. Their friendly and timely advice made the project more enjoyable and much less stressful than I initially imagined. I would like to acknowledge the U. S. Army and the dedicated Department of the Army Civilian workforce that are the behind-the-scenes heroes and heroines that support the nation's soldiers. I would never have achieved this milestone in my life if it were not for the many faculty, fellow learners, and friends who helped and supported me along the way. Moreover, this work is especially dedicated to the loving and constant support of my partner for life, Sharon Rose O'Donoghue Swain.

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CHANGES IN INSTRUCTIONAL SYSTEM DESIGN (ISD): IMPROVING TRAINING PRODUCT DELIVERY TO UNITED STATES ARMY SOLDIERS

Training development is a vital component of the mission of Training and Doctrine Command (TRADOC) to prepare the Army for war. Preparation of the Army for war is the responsibility of every civilian and soldier in management and training-related roles in the TRADOC HQ, schools, and supporting contractor offices. One means of creating training products for use in the field is Instructional Systems Design or ISD. ISD is a widely used methodology for developing training programs. The ISD field of study in education uniquely combines disciplines from business to psychology. The process and procedure have various monikers: Instructional System Design & Development (ISDD), the Systems Approach to Training (SAT) (the Army's chosen nomenclature), or just Instructional Design (ID). This approach is a repeatable step-by-step process to develop training materials and evaluate the effectiveness of an instructional event. Specifically, "ISD, evolved from post-World War II research in the United States military to find a more effective way to create training programs."[1] The Army adopted its current instructional system design, the SAT process in the 1970s.[2]

While useful when adopted, much has happened in the last thirty-five years. The velocity of recent technological change that has occurred throughout society, for example, has resulted in the "Rapid acquisition and fielding of new technology, spiral integration of system of systems innovations and exploitation of best business practices that demand new ways of thinking and new ways of managing change at every level of Army leadership."[3]

The technological advantage the U.S. Armed Forces possess is very evident in the War on Terrorism, especially the war with Iraq. Despite these successes, commanders have indicated in after action reports that training needs improving. For example, the Third Infantry Division After Action Report stated:

> FBCB2 as a command and control medium was extremely useful and effective. It provided unprecedented situational understanding for all commanders and command posts. It also allowed the BCT to forward graphics, messages, and fragmentary orders (FRAGOs) across distances that FM could not cover. Limitations included the lack of training received on all facets of the system, poor performance of electronic messaging, and a limited number of systems that allowed fielding to company commander and executive officer level in maneuver units only. To correct these shortfalls Blue Force Tracking (BFT) should increase its messaging capabilities and be fielded to every vehicle in the division.[4]

The need for faster response times in creating training for soldiers became obvious as the enemy attacked using asymmetric means and methods. For instance: during the war, a mine identification-training product was needed immediately. The normal SAT process would have

taken 18 months to complete the project. The Engineer School produced the product in 30 days. This abbreviated process worked, but the Engineer School methodology is neither sanctioned nor approved in the current TRADOC Regulation 350-70, the guidance for the SAT process.

Nowhere is this new thinking more important than in the Army's development of training, and especially, ISD. As a result, senior Army Leaders responsible for training are asking whether a thirty-year-old instructional system design process can be effective for today's Army? As Major General Barrett observed during the March 2003 Distributed Learning Conference, "We can no longer take 18 months to produce the training products the Army needs to be effective in combat. When changes in weapons systems occur at an increasing rate of speed."[5] Quite specifically, Major General Barrett questioned: "Does the SAT process meet the needs of the force that must be able to change dramatically over the next five years to meet the training challenges of new weapon systems, new tactics and doctrine?"[6]

Indeed, changes in ISD over the last thirty years have been considerable. ISD models like Rapid Prototyping, Tutorial, Experiential and Elaboration have been effective in producing training products for the civilian market. We should expect to identify differences in the instructional system design process that worked in the 1970s compared to the instructional system design process used in 2005. Changes in techniques of teaching and learning also affect the instructional system design process. Better, faster, cheaper ways to create instructional products for the Army might be available. The SAT process might or might not be the correct process to meet the goals of a 21st Century Army. Given these circumstances, we should carefully study the Army's current instructional design and delivery. A systematic analysis of the characteristics of the instructional system design process in the U. S. Army logically follows. This description and analysis could provide a significant part of the answer to the question: What factors can influence the reduction of process time in the U.S. Army?

BACKGROUND OF THE STUDY

The Army's training development process is based on a systematic, spiral approach to making collective, individual, and self-development training decisions for the total Army. The process determines whether the training is needed; what is to be trained; who gets the training; how, how well, and where the training is presented; and the training support/resources required to produce, distribute, implement, and evaluate those products. The process involves five training related phases: analysis, design, development, implementation, and evaluation.[7] Table 1 shows the accepted acronym for this process, which is ADDIE.

A	ANALYSIS
D	DESIGN
D	DEVELOPMENT
I	IMPLEMENTATION
E	EVALUATION

TABLE 1: (ADDIE) INSTRUCTIONAL DESIGN MODEL [8](CLARK, 1999)

This basic ADDIE process was adapted and enlarged. The model, graphically illustrated below, called the Interservice Procedures for Instructional Systems Development (IPISD), was intended for use with large-scale instructional development. The IPISD is the precursor of the SAT.

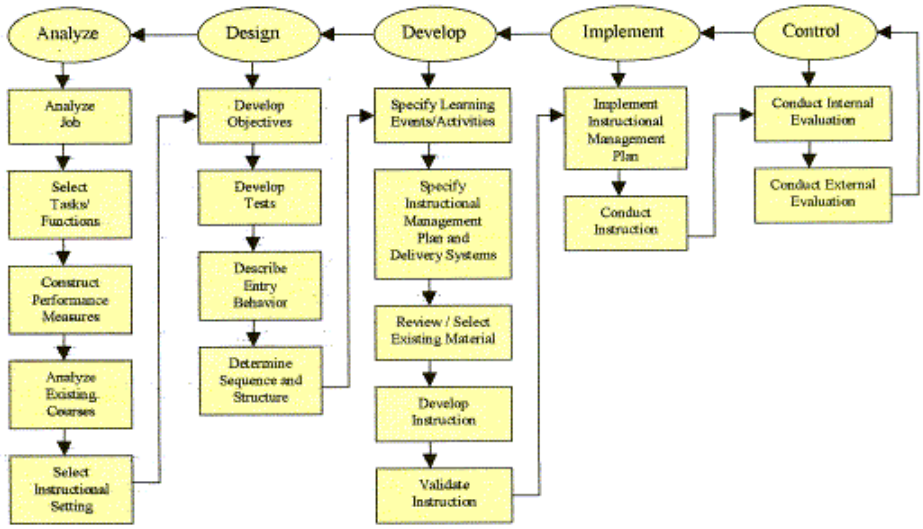


FIGURE 1: INTERSERVICE PROCEDURES FOR INSTRUCTIONAL SYSTEMS DEVELOPMENT (IPISD)

The background to the problem of whether the current ISD is adequate is best illustrated by actions of the 1990s which included the business process of right sizing, downsizing, concentration on the core competency of the organization, and contracting out non-core competencies of the business enterprise. The Training Development community within TRADOC was drastically reduced in the 1990s (41% reduction in civilian personnel from FY91 to FY01)[9]. Moreover, during this period, TRADOC's workload had grown because of new missions since 1995. Additionally, a Government Accounting Office (GAO) investigation of TRADOC's readiness to perform its mission noted that between 1995 and 2001 the number of

essential TRADOC personnel assigned to develop Distance Learning Products conduct this mission declined from 80% of authorized positions in 1995 to 71% in 2001. Worse still the GAO Report specifically indicated that 30 reporting units of TRADOC reported the lowest readiness status due to personnel shortages. Without adequate number of training development personnel the SAT process is difficult to implement.[10]

CURRENT SYSTEM

Management at all levels needs both to understand the SAT process and to ensure its efficient implementation. Success in doing so will save scarce resources: personnel, time, and unnecessary product development dollars. The SAT is best described as a diagram. Figure 2 graphically portrays the cyclical nature of the SAT process. Figure 3 depicts how each phase of the SAT model builds upon preceding phases. Although the phases build upon each other, it is important to remember that the normal training development process for a new training development requirement begins with evaluation (a perceived training requirement) and proceeds with other analyses, followed by design, development, and implementation of the training/training product.[11] At the same time, each phase and product must meet minimum essential requirements.[12] Not all phases have to be followed in order; each phase can be entered individually as needed for revisions. The process is a continuous series of development, revision, and implementation events.

Evaluation permeates all phases and is the cement that ensures all training and training products are effective in producing trained units and soldiers. Products are evaluated either formally (i.e., product validation) or informally to determine currency, efficiency, and effectiveness, followed by revisions as required.

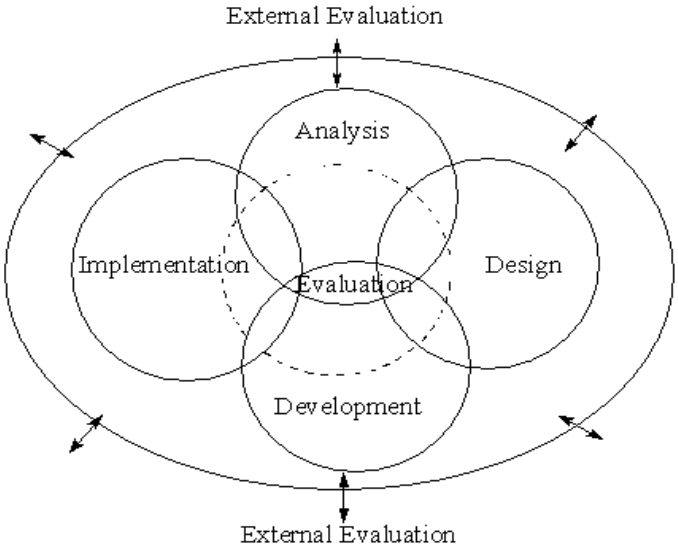


FIGURE 2: SYSTEMS APPROACH TO TRAINING (SAT) PROCESS

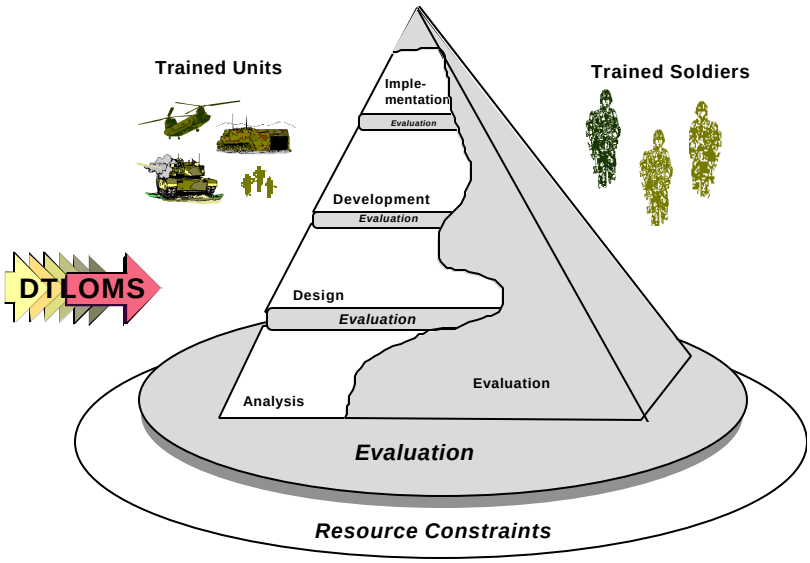


FIGURE 3: SYSTEMS APPROACH TO TRAINING (SAT) PROCESS

TRADOC Regulation 350-70 provides guidance on implementing SAT. TRADOC Regulation 350-70 states "*Bottom Line:* Proper use of the SAT process will result in development of essential training/products and conservation of resources". The regulation recognizes the methodical approach inherent in SAT and identifies many techniques to manage Training Development efficiencies:

1. **Revise/Update** analysis and design data when changes occur instead of going through the entire analysis, design, and development processes
2. **Redesign/revise existing** products versus begin new product development when possible.
3. Set up a **dedicated team composed** of a team leader (Instructional Systems Specialist); appropriate AC and RC SME(s); and editor, visual information specialist, evaluation personnel, and training specialist(s) as necessary.
4. **Train** team members in the SAT process.
5. Keep the **same** team throughout the development/revision.
6. A dedicated team can perform analysis, design, and development functions more efficiently and save more staffing time than developers working in various divisions doing various jobs.
7. Use TD automation tools as they become available to meet SAT process and management requirements, e.g., ASAT suite
8. The TD automated workload management database (currently ASAT [Resource Management menu option]) to plan and prioritize workload and assist in personnel management
9. Contracting for additional or specialized TD support.
10. Access Reserve Component assets when possible: Title 10 (coordinate with Office of the Chief, Army Reserve [OCAR] and the National Guard Bureau [NGB]) and Title 32 (coordinate with state Adjutant Generals) for TD support of TATS Courses
11. Develop products in a structured writing format when feasible[13]

Despite these efforts and shortcuts, the current SAT process is cumbersome, highly detailed, and rule intensive. For instance, according to planning figures, 8655 man years were needed in 2002 to implement the SAT process for all schools. However, due to personnel shortages, only 3244 man years were available, resulting in a backlog of 5411 man years of Training Development work for 2002 alone.

Given the lack sufficient personnel necessary to use the SAT system and the lengthy, cumbersome methodology, should TRADOC retain the process? In an initial effort to answer that question, the author asked Dr. Robert K. Branson, creator of the process, whether SAT is still an appropriate method of instructional design. Briefly, Dr. Branson answered that he was amazed with the universal acceptance of the process, which he believed to be a major strength. But, Dr. Branson also noted that many paths can get you to your goal, as long as you know what you want at the end.[14]

As part of the interchange, the author asked Dr. Branson about the importance of the quality assurance portion of the SAT process. Dr. Branson's comments both reinforced the SAT model and gave the Army leeway to find other methods to develop training materials that soldiers need to increase their combat readiness and enhance soldier survival. Doctor Branson responded:

> There is no known way to have an effective quality control/quality assurance program without collecting the necessary product and process evaluation data. Without quality control and quality assurance functions, there can be no effective control function in a system. Without a control function, there can be no system. As you all know, evaluation data can be used for assessing, improving, and establishing the value of problems in any instructional program. Evaluation data, in the hands of the inspector general, can also be used as a vehicle to indict practitioners. When evaluation or quality control data are used as a club, the normal human response is to eliminate the evaluation function, or the evaluator -- or both.[15]

In a final observation, Branson described precisely what happened to the Quality Control/Quality Assurance function in the United States Army in 1992. The Directorate of Evaluation and Standardization (DOES) was the organizational predecessor of the Quality Assurance Office. The Directorate of Evaluation and Standardization converted from the role of evaluation designed to assist the system to a form of inspection. Many organizations in TRADOC viewed DOES as a threat, so many of them simply disbanded the organizations. Some Directorates of Evaluation and Standardization survived due to the method of evaluation practiced and their offices contribution to the school. Some schools renamed the DOES to camouflage the function in other divisions or directorates within the organization. This was done to save the capability within some organization. Some schools, like the Air Defense Artillery School, eliminated the function completely. However, what is significant to understand is the Evaluation/Quality Control/Assurance function is critical to the SAT process to be effective.

AN ANALYSIS OF SAT

To determine whether SAT continues to meet the needs of the force or will need to be adapted or replaced, first requires an assessment of the current SAT process. To assist in the assessment, the author received permission to ask the Civilian Training Leaders in the U.S. Army what they thought about SAT and how to improve it.[16] The questionnaire sought to draw insights into:

- The relationship of abbreviating steps in SAT process;
- The Army Instructional System Design process as it is implemented currently;
- The challenges facing Army trainers in implementing the SAT process;
- Any correlation between the abbreviations of the steps in the SAT process and increased speed of training product delivery to Soldiers.

DISCUSSION (CURRENT SYSTEM INADEQUATE)

Only 23.1% of the Civilian Training Leaders rated SAT as "Very Effective". Another 34% indicated that SAT is "Somewhat Effective". A further 16.9% responded that SAT is "Neither Effective or Ineffective". An additional 8.7% of Civilian Training Leaders indicated that SAT is "Somewhat Ineffective". Finally 5.6% of respondents rated SAT as "Very Ineffective". That only 57% of the Civilian Training Leaders believe SAT is effective in meeting the Instructional Development needs of the U.S. Army, is not a ringing endorsement of the process. The table below compares the percentages for each of the steps:

SAT Steps	Analysis	Design	Development	Implementation	Evaluation	Total
Very Effective	27.8%	20%	21.1%	23.3%	23.3%	23.1%
Somewhat Effective	31.1%	27.8%	40%	40%	31.1%	34%
Neither Effective or Ineffective	15.6%	22.2%	16.7%	12.2%	17.8%	16.9%
Somewhat Ineffective	8.9%	13.3%	5.6%	8.9%	6.7%	8.7%
Very Ineffective	5.6%	4.4%	5.6%	3.3%	8.9%	5.6%
No Response	11%	12.3%	11%	12.3%	12.2%	11.7%
Total	100%	100%	100.%	100%	100%	100%

TABLE 2: SYSTEMS APPROACH TO TRAINING COMPARISON

Identifying overall satisfaction or dissatisfaction with SAT is only a first step in understanding the strengths and weaknesses of the process. Of greater importance, perhaps, is understanding why Civilian Training Leaders think the process is challenged? To identify possible areas of weaknesses, respondents were asked: "In your opinion what are the top three challenges facing the SAT (Systems Approach to Training) process in the United States Army?" The top three challenges indicated by these leaders were, first, the current SAT process is fine, but military leaders do not know how to manage the process. Second, there are not enough Training Developers to implement the process. And, third, there aren't enough Training Leaders who understand the SAT Process.[17]

The below responses indicate an overwhelming perception of the need for more personnel and funding for SAT. Tables 3 and 4, respectively, graphically portray the data.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
"Very Insufficient"	43	50.0	51.8	51.8
"Somewhat Insufficient"	28	32.6	33.7	85.5
"Neither Sufficient or Insufficient"	3	3.5	3.6	89.2
"Somewhat Sufficient"	8	9.3	9.6	

98.8

"Very Sufficient"
1
1.2
1.2
100.0

Total
83
96.5
100.0

Missing
System
3
3.5

Total
86
100.0

TABLE 3: PERSONNEL SUFFICIENT TO MEET SAT REQUIREMENTS

Frequency
Percent
Valid Percent
Cumulative Percent

Valid

"Very Insufficient"
40
46.5
48.2
48.2

"Somewhat Insufficient"
28
32.6
33.7
81.9

"Neither Sufficient or Insufficient"
4
4.7
4.8
86.7

"Somewhat Sufficient"
10
11.6
12.0
98.8

"Very Sufficient"
1
1.2
1.2
100.0

Total
83
96.5
100.0

Missing
System
3
3.5

Total
86
100.0

TABLE 4: SUFFICIENT FUNDING FOR THE SAT PROCESS

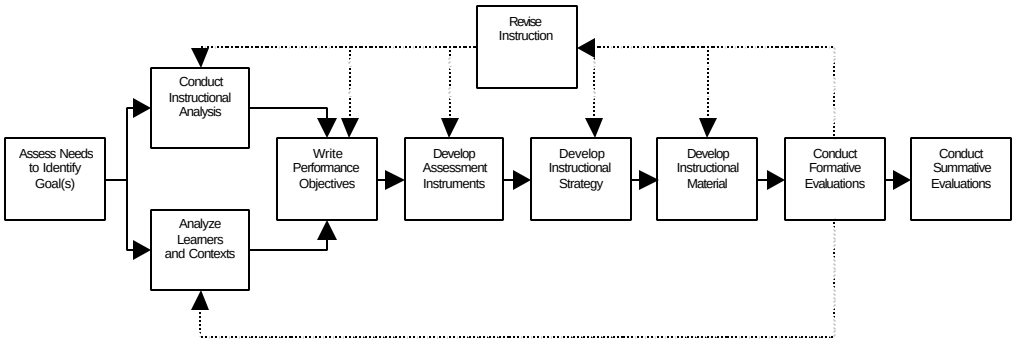
Forty three percent of the Civilian Training Leaders agreed that “Current SAT process is fine, but military leaders do not know how to manage the process”. The revolving and rapid turnover of Directors of Training at TRADOC Schools is a possible reason why military leaders are not able to manage the SAT process. Interviews with Senior Civilian Training Leaders indicate the lack of personnel and funding sets the system up to fail under any leadership.[18] The Military Leader is placed into a difficult situation without adequate training and experience.

In general, 12.5% of Training Leaders stated that the *SAT process is not adequate for today’s training needs: the speed of change in weapons systems and training outpace the SAT*. Respondents pointed out that 44% found it necessary to abbreviate the SAT process. In fact, when the question was asked slightly differently, i.e., is there a need to accelerate the Instructional System Design process, 65.1% found a need to accelerate the process. This large percentage indicates that a change in the process is necessary.

Despite their dissatisfaction, respondents indicated a loyalty to the SAT process. Examples of these comments include “SAT process is not time driven, but event driven. It must be resourced to work.” “SAT is not the problem, PPBES is the problem. Resourcing for equipment, students and instructors severely impacts SAT!”

That only 57% of the Civilian Training Leaders who responded to the survey believe SAT is effective in meeting the Instructional Development needs of the U.S. Army, is not strong support for the process. Respondents pointed out that 44% abbreviated the SAT process whereas 65.1% found a need to accelerate the process. These responses point to significant challenges to the viability of the SAT process.

Despite their loyalty to the SAT process, respondents clearly indicated considerable dissatisfaction with the process. Significantly, this dissatisfaction was spread across all aspects of the process. That roughly half of all training developers found the process to be deficient is a clear indication that the current SAT process requires considerable revision, or even replacement.



ALTERNATE PROCESSES

A number of alternate processes exist to replace or improve SAT. For the purpose of analysis in this paper, five designs in Instructional System Design will be examined: the Dick and Carey Model, the Rapid Prototyping Model, the New Component Design Theory Tutorial Model, the New Component Design Theory Experiential/Tutorial/Advisor Model and the Elaboration Principle.

THE DICK AND CAREY MODEL

The Dick and Carey Model is a linear step-by-step model (see Figure 4). The model assesses needs, identifies goals, and then conducts an instructional analysis while analyzing learners and the contextual nature of the material. The next step is to write the performance objectives, followed by developing assessment instruments, instructional strategy, and instructional material. There is then a formative evaluation, which will result in revising the instruction. The last step is to conduct a summative evaluation.[19] The biggest drawback to this model is its linear, step-by-step process. Dr. Gus Prestera, an instructional design consultant and former e-Learning leader with Allen Communications, says of the Dick and Carey Model; "In my specific context, the Dick and Carey model represents a fairy-tale, describing how instruction could be developed if we had unlimited time, knowledge, and resources." [20] Additionally, expert writers on ISD, Wilson, Jonassen and Cole offer criticism of the Dick and Carey Model in *Cognitive Approaches to Instructional Design:* "From its inception, ID practice has fallen short of its ideal prescription. Based on cybernetic principles of general systems theory, the ideal design process relies on constant systemic feedback." [21] Due to the step-by-step linear process, the Dick and Carey Model is not recommended to replace the SAT process.

FIGURE 4: DICK AND CAREY INSTRUCTIONAL SYSTEM DESIGN MODEL [22]

THE RAPID PROTOTYPING MODEL

Rapid Prototyping Model, (see Figure 5) was originally a concept in the software development field but is now regarded as a systems and product development model. The concept of rapid prototyping initiates a teaming approach, which uses concepts of spiral development to create training. In assessing the Rapid Prototyping Model Gus Prestera asserts,

> Generally, rapid prototyping models involve learners and/or subject matter experts (SMEs) interacting with prototypes and instructional designers in a continuous review/revision cycle. Developing a prototype is practically the first step, while front-end analysis is generally reduced or converted into an on-going, interactive process between subject-matter, objectives and materials. [23]

Wilson, Jonassen and Cole describe the Rapid Prototyping Model as "In a design process, early development of a small-scale prototype used to test out certain key features of the design. Most useful for large-scale or projects." [24] ISD writers, Edmonds, Branch and Mukherjee, however warn that the Rapid Prototyping Model should be used only by experienced Instructional Designers. They also criticize the model as a capitulation to time demands. [25]

The major weakness of the Rapid Prototyping Model is that it does not have a formative or summative evaluation. This weakness in the model could be overcome by the addition of constant evaluation and feedback loops. With the addition of evaluation in this model and an effective training program the Rapid Prototyping Model is recommended as a possible replacement of the SAT process. This model could replace the SAT process.

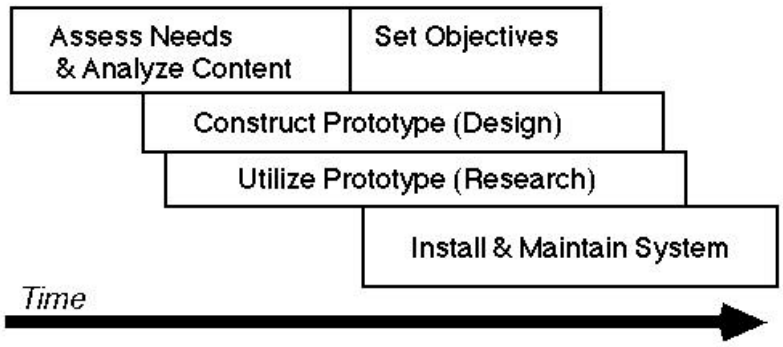


FIGURE 5: RAPID PROTOTYPING MODEL [26]

THE NEW COMPONENT DESIGN THEORY TUTORIAL MODEL

The New Component Design Theory Tutorial Model (see Figure 6) is a Computer Assisted Instruction Model based on the Branching Programmed Instruction Model. The Tutorial Model is both an instruction and instructional design model. The model presents a page of text to a learner to study. After study, the model asks a question of the learner. If the learner's response is correct, the model provides positive feedback. If the learner's response is incorrect, the model provides feedback and remedial material, and the cycle is repeated. This questioning technique is known as the Socratic Method and is a basis of teaching and learning.[27] The advantage of this model is its simplicity and its ability to teach. One major disadvantage is that many things do not lend themselves to this type of teaching, for example teaching how to operate machinery, trouble shooting electrical circuits, and designing a piece of equipment. The Tutorial Model is a great instructional tool, however due to its severe limitations as indicated above the model is not recommended to replace the SAT process.

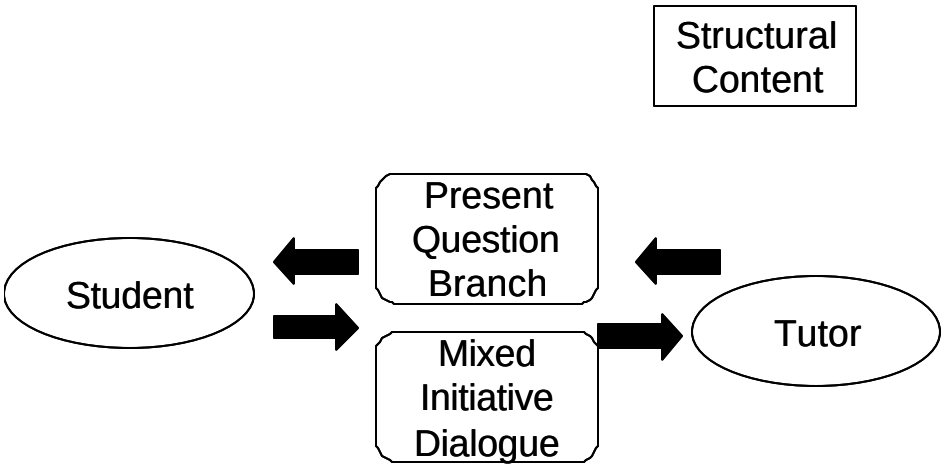


FIGURE 6: TUTORIAL MODEL[28]

EXPERIENTIAL/TUTORIAL/ADVISOR MODEL

The Experiential/Tutorial/Advisor Model (see Figure 7) uses computer technology as a method in the design of instruction. As with the Tutorial Model, the Experiential/Tutorial/Advisor Model is both an instructional model and instructional design model. The technology can be used as a tutor and as a simulation. The simulation is a micro-world that the learner can influence and scrutinize. Almost all instruction can be simulated and the learner can be given control over the simulation. The computer can be a mentor that monitors learner performance providing help and assistance when needed. The computer can perform many things simultaneously with the most effective learning coming from the interaction of the learner with the subject matter in multiple learning modalities, such as observation, active experimentation, Socratic Dialogue, and simulation.

This model is a basis of what is called discovery learning. Discovery learning is constructionist method of instruction, which is a concept in designing education for adults. This model reinforces adult learning principles articulated by Malcom Knowles.[29]

The model is best used to teach processes, but it can be applied to almost all material. This is a wonderful instructional design model and is used extensively in interactive multi-media instruction and computer assisted simulation training. The major shortfall of this model is the time needed to develop this micro-world with all the branches and sequels necessary for a vibrant learning experience. This model can take appreciably more time to develop instruction

than the SAT process. Therefore, this model cannot be recommended to replace the SAT process.

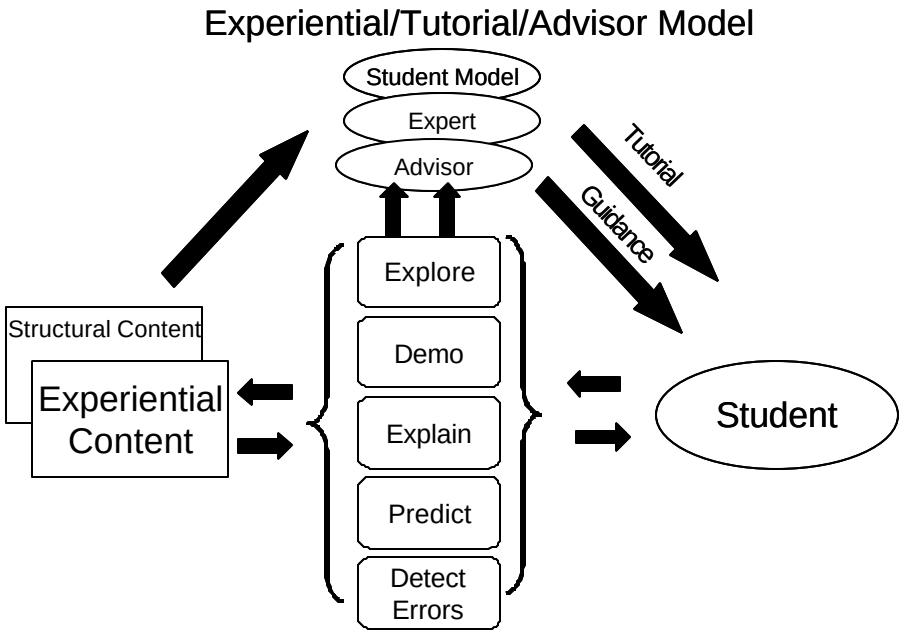


FIGURE 7: EXPERIENTIAL/TUTORIAL/ADVISOR MODEL[30]

THE ELABORATION PRINCIPLE

The Elaboration Principle (Figure 8) is a model and a schema for the presentation and design of instruction. The Elaboration Principle "promote[s] incremental elaboration of the most appropriate cognitive structures to enable the student to achieve increased generality and complexity in the desired learned performance".[31] In Elaboration, the subject matter must be sequenced and organized in a way that promotes learning in a gradual way that increases in complexity. The course organization, which looks like a graphic organizer, is the basis on which the instruction is built. Instruction usually consists of modules, each module is composed of lessons, and lessons are composed of learning activities. The path through the course organization can be left to the learner or can be determined by the instructional designer. Tracking mechanisms are used to follow the learner through the instruction.

Elaboration is an effective design method. The material can be structured in sequences that assist the student to learn prerequisite material first. The method then would allow the student to go into more depth in a particular area. This ability to drill down to the details is a popular method in web-site design. This method is quite unstructured and depends heavily on the subject matter expertise of the developer. However, such subject matter expertise normally is nonexistent with new weapons and equipment. This method, therefore, is not recommended to replace SAT process at this time.

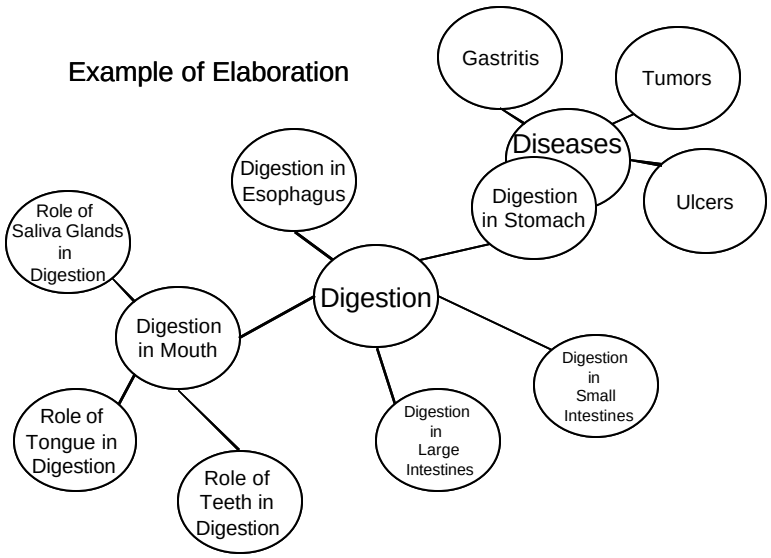


FIGURE 8: ELABORATION PRINCIPLE[32]

COURSES OF ACTION AND ANALYSIS

Of the several Instructional System Design processes just discussed, only the Rapid Prototyping Model (with a formative and summative evaluation added to the model) appears feasible. Another alternative is to continue to use the existing SAT, but to adapt it, perhaps considerably. The discussion that follows will examine eight possible options for adapting the current SAT process that were addressed to Civilian Training Leaders that focused on increasing the speed of delivery of training products to soldiers.

Courses of Action	Percent of Civilian Training Leaders Recommending
1. Increase the Education and Training of the Training Developers.	20%
2. Increase the funding to develop training products.	22%
3. Abbreviate or change the SAT process.	6%
4. Contract out parts of the Instructional System Design Process	7%
5. Hire more Training Developers	21%
6. Create multi-disciplinary teams to implement the SAT Process	15%
7. Use a different Instructional System design process	3%
8. Teach the Military Training Leaders to effectively implement the SAT process.	36%

(Note: Responses will not add up to 100% because respondents could choose multiple answers.)

TABLE 5: CIVILIAN LEADERS OPINIONS

INCREASE THE EDUCATION AND TRAINING OF THE TRAINING DEVELOPERS

As indicated in Table 5, above, 20% of respondents to the SAT Questionnaire pointed out that increasing the education and training of the training developers would speed the production of training to soldiers. Increasing the knowledge and training that the developer receives will enhance the output and productivity to the soldier. This is a good option that over time will enhance productivity.

A key question, however, remains: how to ensure that in a period of constrained time, dollars and personnel, the appropriate personnel can actually receive such training? Reporting on the training qualifications of the civilian training developers would be an initial step in understanding the scope of the training requirement. Individual Training Plans, which are submitted to career program managers at each school and consolidated at TRADOC DCSOPS&T, would indicate the level of training developers' competency and proficiency. Evaluation of the education and training of training developers could be accomplished by the Quality Assurance Office at each installation or proponent school.

INCREASE THE FUNDING TO DEVELOP TRAINING PRODUCTS

Twenty two percent of the Civilian Training Leaders who responded to the questionnaire indicated that increasing funding to develop training products would speed up the process. The

increase in funding to develop training products directly relates to personnel authorizations. Anecdotally, increases the in TRADOC budget in the past have not positively affected training development. Since manpower is the major cost in training development, a reduction in civilian personnel budget has a dramatic impact on training development. The GAO Report, *Army Needs to Address Resource and Mission Requirements Affecting Its Training and Doctrine Command Feb 2003* stated, "Likewise, the increase in funding was not uniform across TRADOC budget categories. For example, between fiscal years 1995 and 2001, funding in the civilian personnel budget category decreased by $60 million, while contract funding increased by $317 million. The decrease in civilian personnel funding resulted in the loss of personnel authorizations."[33] The authorization problem is in the process of being corrected.

Current TRADOC manpower authorizations show increases in personnel assigned to training development in FY 04 with 931, FY 05 with 1080, and FY 06 with 1075. The increase in authorizations, if they result in actual assignments, will certainly help address the problem. This problem is illuminated in the GAO Report *Army Needs to Address Resource and Mission Requirements Affecting Its Training and Doctrine Command Feb 2003* stated;

> They noted that in several instances the Army provided funding for transformation related activities but did not provide the associated personnel authorizations.[34]

ABBREVIATE OR CHANGE THE SAT PROCESS

Six percent of the Civilian Training Leaders indicated they believe abbreviating or changing the SAT process would speed up training development. Interestingly, however, 44.2% questionnaire respondents indicated that they had abbreviated the SAT process in the past 6 months. The inconsistency can be explained in two ways. First, the pressure to deliver training products due to mission requirements is causing Civilian Training Leaders to abbreviate the process. Second, the resistance to abbreviation is due partly to normal human resistance to change and the loyalty to the organization to produce the best training product for the soldier and the Army.

There are drawbacks to this option. For example, abbreviation could result in an incomplete task analysis, which might omit a step in a procedure thereby leading to damaging equipment or placing soldiers at risk.

To mitigate these risks, TRADOC could adopt a Rapid Prototyping-type development model. This could shorten the time for fielding training products. This model could be tested at proponent schools by a formal experiment, which would compare the development of a training

product using both processes, (SAT and Rapid Prototyping) and determine which process delivers a better training product quicker.

CONTRACT OUT PARTS OF THE INSTRUCTIONAL SYSTEM DESIGN PROCESS

Seven percent of the Civilian Training Leaders believe that contracting out parts of the ISD process would speed the development of training products. One problem with contracting out portions of the process is the need to supervise the delivery of the products. The Contracting Officer Representative who approves the delivery of the products normally does not have the expertise to know what a good training product is.[35] The delivery schedule and review process is normally so constrained that the reviews are usually not thoroughly completed. Personal experience with the process has reinforced this point, as a representative comment from one Civilian Training Leaders indicates:

> Currently, I am reviewing ____ products for _____ delivered by a contractor. The contract had been let and work had started by the time I reported for work. I know that they had to take some short cuts because they wanted ___ tasks converted to ____in six months. I don't know what your experience has been with contractors, but I have not seen many products that are worth the money the government is paying. It is a multifaceted problem. The product will only be as good as the Government Furnished Information (GFI). The GFI is often developed without the proper analysis; frequently because the training developer does not know how to do it, there is no emphasis on it, or because there is not sufficient time. Time of course is another contributor. Often it is a matter of getting lessons learned out ASAP to those soldiers being deployed.[36]

In 2001, TRADOC had 1609 contracted training developers compared to 886 Department of the Army civilian training developers. The TRADOC cost differential for contracted training developer is $60.10 an hour to $39.00 an hour for Department of the Army civilian training developer.[37] Despite the drawbacks, the use of contracting can add to Training Development capacity in the short term. The need for close supervision and adequate quality control of contracted products is essential to make contracting worthwhile. One also must recognize that such a level of oversight will take training developers away from their primary duties, potentially exacerbating problems the contracting out was supposed to solve.

HIRE MORE TRAINING DEVELOPERS

Twenty one percent of the Civilian Training Leaders indicated the solution to the problem is to hire more Training Developers. Reductions of Training Development personnel over the last decade are a major reason for the shortfall in the quality and quantity of Training Products produced at TRADOC Schools. The GAO Report[38] confirms this problem:

> Moreover, the Command [TRADOC] has workload backlogs in other mission areas, such as developing training materials and Army doctrine...Furthermore, two Army leadership panels concluded that TRADOC's training and development standards had deteriorated, and mechanisms for evaluating training and leader development programs were lacking.[39]

Any solution to the problem should include hiring full-time Army Civilian Employees who can perform the Training Development task.

CREATE MULTI-DISCIPLINARY TEAMS TO IMPLEMENT THE SAT PROCESS

The creation of multi-disciplinary teams to implement the SAT process garnered support from 15% of respondents. The use of multi-disciplinary teams in the development of Distance Learning Training products has been very effective in a number of TRADOC Schools.[40] The successes were reinforced by TRADOC DCSOPS&T giving the U.S. Army Engineer School special permission to establish a multi-disciplinary team to develop training products. This option can be highly successful with appropriate teaming and leadership. DCSOPS&T has been willing to grant this permission upon request and recommended it in TRADOC Regulation 350-70. This represents an avenue that should be pursued.

USE A DIFFERENT INSTRUCTIONAL SYSTEM DESIGN PROCESS

Only three percent of the Civilian Training Leaders indicated that using a different Instructional System Design would speed up the development of training products. However, their satisfaction may be due to their comfort with the status quo, which may not be useful in the long-term. A comment from one of the Civilian Training Leaders is an example,

> I wholeheartedly endorse the SAT process because it's a tried, proven process that produces top quality training products and programs. However, continued reliance on Army/TRADOC Schools, and their Training Developers, will spell disaster for future Army Training. Current, rapid technology and spiral development is eating our lunch. We must ensure systems procurement contracts include appropriate, simultaneous training development IAW the SAT process if we're to keep up and maintain currency and relevancy. Meanwhile, we're falling more behind each passing day.

As indicated earlier, the Army should support experiments at a number of schools comparing the Rapid Prototyping Model or other models to the SAT Model in the development of training products. Because most Civilian Training Leaders in the Army have little to no experience with other Instructional System Design processes, this experimentation should be overseen by the Army Research Institute. This analysis should be completed as soon as possible.

TEACH MILITARY TRAINING LEADERS TO EFFECTIVELY IMPLEMENT THE SAT PROCESS

Thirty six percent of the Civilian Training Leaders indicated that teaching Military Training Leaders the SAT process would significantly improve implementation of the process. This observation identifies the problem of the revolving door that many Military Training Leaders have been experiencing. Specifically, the rotation of Directors of Training at many TRADOC Schools needs attention. During my ten years of experience in TRADOC Schools, I have not observed a Director of Training spending more than eighteen months in the position. Moreover, Military Training Leaders normally have little formal education in the process they are leading. Despite the fact that courses are available to teach Senior Leaders about the process, few have the time or inclination to take the courses. TRADOC should require School Commandants to ensure Military Training Leaders undergo this training.

CONCLUSION

The realities of the Global War on Terrorism and the responses of Civilian Training Leaders clearly indicate that the SAT process needs improvement. Although SAT has produced great training products for over 30 years, it is an industrial age model. Unfortunately, the time is past for the lock step methods that produced highly competent, behaviorally trained soldiers. The lack of funding and personnel to perform the function only exacerbated the problem. A new, information age model is needed. As stated earlier. “Current, rapid technology and spiral development is eating our lunch.”

RECOMMENDATION

Stated simply and directly, the following actions will increase the speed the development of training products in the U.S. Army. In the short-term: hire and train more training developers immediately. Direct TRADOC Schools to form the Training Developers into multi-disciplinary teams and use automated tools that will speed the SAT process (e.g. Designers Edge). Additionally, make evaluation of the SAT process part of the Quality Assurance Office mission. To identify a long-term solution, immediately begin experimenting with Rapid Prototyping in a head-to-head contest with the SAT.

WORD COUNT=6819

APPENDIX A - SYSTEMS APPROACH TO TRAINING QUESTIONNAIRE
ARMY RESEARCH INSTITUTE CONTROL NUMBER DAPE-ARI-AO-04-25, RCS: MILPC-3

Directions

Please complete all applicable items in this questionnaire to the best of your abilities. Prior to responding to each item, please read it carefully while considering the training products you or your team developed during the last 6 months. This 2-page questionnaire should take about 15 minutes to complete.

Select appropriate responses with checkmarks; these can be made with either pen or pencil. When finished, please forward the paper version of your questionnaire to: Richard W. Swain, 1400 Waggoners Gap Road, Carlisle, PA 17013. If you have any questions or concerns about this questionnaire please contact Richard Swain at 1-717-243-8262 or 1-915-525-9372. Your individual answers will be kept strictly confidential. Your answers will be combined with other training developers to describe the current status of Instructional System Design in the United States Army. If you would like a copy of the results of this research please contact me at RickWSwain@aol.com or Richard.Swain@carlisle.army.mil

Part One Methods Used In Development Of Training Products

Q1. In the past 6 months, did your team find it appropriate to abbreviate or eliminate steps in the instructional systems design process for most of the products developed?
Yes
No
Q2. Did your team use Designer's Edge, a software tool provided by the US Army for the specification of steps in the design process, in the development of these products that you produced in the past 6 months?
Yes
No

Q3. For most of the training products developed over the last 6 months, did your team find it necessary to accelerate the instructional systems design process?
Yes
No
Part Two : Measuring Effectiveness of Specific Instructional System Design (ISD) Components (Effective meaning; producing or capable of producing an intended result or having a striking effect)

	Very Effective	Somewhat Effective	Neither Effective or Ineffective	Somewhat Ineffective	Very Ineffective
Q4. How effective was the Instructional System Design training that you received in the Army?	❍	❍	❍	❍	❍
Q5. How effective was your Analysis portion of the SAT Process in your last development of a Training Product?	❍	❍	❍	❍	❍
Q6. How effective was your Design portion of the SAT Process in your last development of a Training Product?	❍	❍	❍	❍	❍
Q7. How effective was your Development portion of the SAT Process in your last development of a Training Product?	❍	❍	❍	❍	❍
Q8. How effective was your Implementation portion of the SAT Process in your last development of a Training Product?	❍	❍	❍	❍	❍
Q9. How effective was your Evaluation portion of the SAT Process in your last development of a Training Product?	❍	❍	❍	❍	❍

Part Three*: Results from Possible Manipulations of Specific ISD Components*

Q10. What steps in the Instructional System Design Process did you abbreviate or eliminate during the last six months? (check all that apply)
- ? Analysis
- ? Design
- ? Development
- ? Implementation
- ? Evaluation
- ? None (If none skip to Q16)

If any of the above components were modified, what is your estimate of the time savings gained by abbreviating or eliminating…

	80 + work hours	40 to 80 work hours	21 to 40 work hours	11 to 20 work hours	1 to 10 work hours
Q11. Analysis	❍	❍	❍	❍	❍
Q12. Design	❍	❍	❍	❍	❍
Q13. Development	❍	❍	❍	❍	❍
Q14. Implementation	❍	❍	❍	❍	❍
Q15. Evaluation	❍	❍	❍	❍	❍

Part Four: What is your opinion on Challenges and Suggestions

Q16. In your opinion what are the top three challenges facing the SAT (Systems Approach to Training) process in the United States Army? (Choose up to 3)

- ? Any problems with the SAT process in the development of training products are tiny and can easily be overcome.

- ? Current SAT process works well, and the chief difficulty is lack of utilization by Training Developers.
- ? Current SAT process is fine, but military leaders do not know how to manage the process.
- ? Current SAT process is fine, but strict adherence to regulations causes difficulty

- ? In general, SAT is a military process more about rules and guidelines then product
- ? In general, SAT process is not adequate for today's training needs: the speed of change in weapons systems and training outpace the SAT
- ? In general, SAT process is designed for behavioral, not educational, tasks

- ? There isn't enough education and training on SAT
- ? There aren't enough Training Leaders who understand the SAT Process
- ? There aren't enough Training Developers to implement the process
- ? Funding for Training Development over the last decade is inadequate

Other (specify) _____

Q17. Is the number of personnel assigned to Training Development sufficient to meet the requirements of the SAT Process?

- ? Very Sufficient
- ? Somewhat Sufficient
- ? Neither Sufficient or Insufficient
- ? Somewhat Insufficient
- ? Very Insufficient

Q18. How sufficient has the funding to meet the regulatory guidance in TRADOC 350-70 to produce training products?

- ? Very Sufficient
- ? Somewhat Sufficient
- ? neither Sufficient or Insufficient
- ? Somewhat Insufficient
- ? Very Insufficient

Q19. What do you believe would increase the speed of the Instructional System Design Process (SAT Process) in the Army? (MARK ALL THAT APPLY)

- ? Increase Education and Training of Training Developers
- ? Increase Training Development Funding
- ? Abbreviate the SAT Process
- ? Hire more Training Developers
- ? Contract out parts of the Instructional System Design Process
- ? Create multi-disciplinary teams to implement the SAT Process
- ? Use a different Instructional System Design Process
- ? Other_____

Demographics

Please provide the following demographic information. It will only be used to make statistical comparisons between different groups of respondents; it will not be used to profile individual respondents.

Q20. What is your gender?
? Male
? Female

Q21. What is your age?
? 20 - 29
? 30 – 39
? 40 - 49
? 50 - 59
? 59+

Q22. What is the highest level of education you have completed?
? Some high school or less
? High school graduate
? Attended some college
? Associate degree
? Bachelor's degree
? Post-college graduate

Q23. What is your Federal Job Series?
? Instructional System Specialist (1750)
? Training Instruction (1712)
? Instructor (1712)
? Doctrine Developer (0301)
? General Education and Training (1701)
? Combat Developer (0301)
? Education and Training Support (1702)
? Other

ENDNOTES

[1] Kevin Kruse, “Introduction to Instructional Design and the Addie Model e-Learning Guru.com,” 2003; available from <http://www.e-learningguru.com/articles/art2_1.htm. P.2>; Internet; accessed 4 December 2004.

[2] Dr. Robert Branson is the Director of the Center for Performance Technology at Florida State University, a position he has held for over twenty years after his work with the military in the 1970s. Robert K. Branson, "ISD: Is the System Out of Control?" In *American Educational Research Association.* New Orleans, LA, 1984.

[3] Paul J. Kern, “Balancing Transformation with Combat Service Support--Army Materiel Command and Movement to the Future Force March 2004”: *Army Magazine* 2004[journal on-line];. available from <http://www.ausa.org/www/armymag.nsf>. Internet; accessed 20 March 2004.

[4] Department of the Army, *Third Infantry Division (Mechanized) After Action Report*, (Fort Stewart, GA.: United States Army, July 2003), p. 4.

[5] MG Raymond Barrett, “Keynote Address,” Distributed Learning Conference, Williamsburg, VA, March 2003. Cited with permission of MG Barrett.

[6] Ibid.

[7] Department of the Army, *Systems Approach to Training Management, Processes, and Products,* TRADOC Regulation 350-70 (Ft. Monroe, VA.: United States Army Training and Doctrine Command, 9 March 1999), p. ES-1.

[8] Donald Clark, “ISD Big Dog Site Donald Clark,” 22 January 2000; available from <http://www.nwlink.com/~donclark/hrd/history/war1.html>; Internet; accessed 13 July 2003.

[9] General Accounting Office, *Defense Management: Army Needs to Address Resource and Mission Requirements Affecting Its Training and Doctrine Command* (Washington, D.C.: U.S. General Accounting Office, February 2003), p. 30. [Here in after, GAO, Defense Management.]

[10] Ibid., p.28.

[11] For example, the Army purchases a new radio, and it has all the same switches and is operated in the same manner. The evaluation may determine no new training product is necessary.

[12] For example, TRADOC Regulation 350-70 lists the minimum essential requirements, i.e. System Training Plan (STRAP), Training Requirement Analysis System (TRAS), Combined Arms Training Strategy (CATS), Soldier Training Publications (STPs).

[13] Department of the Army, *Systems Approach to Training Management, Processes, and Products,* p. ES-5.

[14] Robert K. Branson, Personal Communication, Question 1, *Doctor Branson do you still think, IPISD/SAT is still an appropriate method of instructional design for the military?* “We recently conducted a survey of thoughts about SAT in a number of TRADOC schools. Contrary

to my experience in the early 1970s, when we were converting CONARC Reg. 350-70-1 to the ISD process, we found universal acceptance of the SAT concept in the 2000 TRADOC schools. This was an incredible change."(Branson, personal communication, 2002)

The second question was; *What do you think the impact would be on this system after 10 years of no evaluation and assessment?* "In the field artillery, we had a process called 'bracketing' prior to the call for fire. Long ago, when there were no laser rangefinders, real soldiers had to crawl up to the observation point and issue the *CALL FOR FIRE*. Bracketing was the only choice before the call Fire for effect. Back to the *CALL FOR FIRE*. There is a really good video/film from the Field Artillery school that shows vivid examples of why bracketing was then critical. One line said: You can do it the right way and hit the target, or you can do it the John Wayne way, and take incoming mortar fire. I like process that can be trained to everyone. How do we learn about that process? Somehow, someone has to figure out what the soldiers/sailors need to know to survive and thrive. That knowledge has to be communicated to those who prepare/train new folks. Acquisition of this knowledge is not obvious and not easy. Is there a better way of doing front-end analysis? I'll bet that there are much better ways. What I don't see is a clear connect between fleet performance and the training system. Currently there is a new Navy program that hopes to address these issues by reorganization: The five Vector Model." (Branson, personal communication, 2002)

The last question was; *What new thoughts do you have on this after thirty years?* "When we originally installed the IPISD into Army schools--and some Navy schools--we learned something bureaucratically real: The term evaluation meant the OER, (sic Officer Evaluation Report) not the process of systematically correcting errors. What I would like to see is a clear definition of what sailors/soldiers need to know on their first duty assignment--call it ISD, SAT--I don't care. How do we know reliably what these folks need to know? So, if I were the CNO (sic Chief of Naval Operation) or the CSA, (sic Chief of Staff United States Army) what would I do? I would demand that we have a process of finding out what folks need to know. When I know that, I can design a development system to make it happen. You have raised a very big question and the resolution to it must come from informed commanders. New commanders MUST make something happen differently. The Army had that problem as did the Navy." (Branson, personal communication, 2002)

[15] Branson, "ISD: Is the System out of Control?", p. 20.

[16] The U.S. Army War College and the Army Research Institute authorized the questioning of the Civilian Training Leaders in the U.S. Army. The survey instrument was sent to participants in October thru December 2004. A total of 281 survey instruments were sent out to the senior Civilian Training Leaders in the U.S. Army. The return rate for the Systems Approach to Training Questionnaire was 30.6%, giving a level of confidence of 95%.

[17] These observations were corroborated by the responses to questions 17 and 18, which are outlined in Table 3 and 4.

[18] Andy Washko, Deputy Director DOTD, interview by author 1 May 2004, Fort Bliss, TX.

[19] The difference between a formative and summative evaluation is the designer conducts the formative evaluation and an independent evaluator conducts the summative evaluation.

[20] Gus Prestera, "Rapid Prototyping Model; Instructional Design Models", 22 March 2004; available from <http://www.personal.psu.edu /users/g/e/gep111/html/M4/L1%20-%20ISD/M4L1P1.htm#rapid_proto>.Internet; accessed 18 May 2004, para 4.

[21] Brent Wilson, David Jonassen, and Peggy Cole, "Cognitive Approaches to Instructional Design." in *The Astd Handbook of Instructional Technology*, ed. G.M. Piskurich, 21.1-21.22. (New York: McGraw-Hill, 1993),pp. 21-22.

[22] Clark,"ISD Big Dog Site Donald Clark

[23] Prestera, "Rapid Prototyping Model; Instructional Design Models", 22 March 2004 ;para 1.

[24] Ibid., p.18.

[25] Gerald S. Edmonds, R.C. Branch, & P. Mukherjee, "A Conceptual Framework for Comparing Instructional Design Models." *Educational Technology Research and Development* 42, no. 4 (1994): 55-72.

[26] Steven D. Tripp, & Barbara Bichelmeyer, "Rapid Prototyping: An Alternative Instructional Design Strategy." *Educational Technolgy Research and Design* 38, no. 1 (1990): 31-44.

[27] M.David Merrill, David I. Twitchell, *Instructional Design Theory,* (Englewoods Cliff, N.J.: Educational Technology Publications, 1994), p. 354.

[28] Ibid., p.355 Fig 17.1.

[29] Adults are autonomous and self-directed, like to relate learning to their experiences, are goal oriented, are relevancy driven in regards to learning, and are practical learners. This model utilizes these principles.

[30] Ibid., p. 356 Fig 17.2.

[31] Ibid., p. 358.

[32] Ibid., p. 362 Fig 17.4.

[33] GAO, Defense Management, p. 16.

[34] Ibid., p. 17.

[35] Andy Washko, Deputy Director DOTD, interview by author 1 May 2004, Fort Bliss, TX.

[36] Anonymous, Personal Communication Subject Survey, email, December 22, 2004

[37] Andy Washko Deputy Director DOTD interview by author 1 May 2004, Fort Bliss, TX.

[38] GAO, Defense Management, p. 16.

[39] Ibid., p. 16.

[40] As the Engineer and Armor School reported this during the March 2003 Distributed Learning Conference

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